

CHARACTERIZATION OF THE NEUROMUSCULAR TRANSMISSION IN THE LONGITUDINAL MUSCLE OF THE MOUSE COLON

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INTRODUCTION

The enteric nervous system (ENS) contains intrinsic primary afferent neurons, interneurons and excitatory and inhibitory motor neurons^{1,2,3,4,5}. The gastrointestinal motility is the result of the coordination activity of smooth muscle cells, neurons of SNE and interstitial cells of Cajal⁵. ATP and nitric oxide are the principal inhibitory neurotransmitters, which produce muscle relaxation^{1,3,4,5,6}. Contractions are triggered by acetylcholine and tachykinins^{3,4,5}.

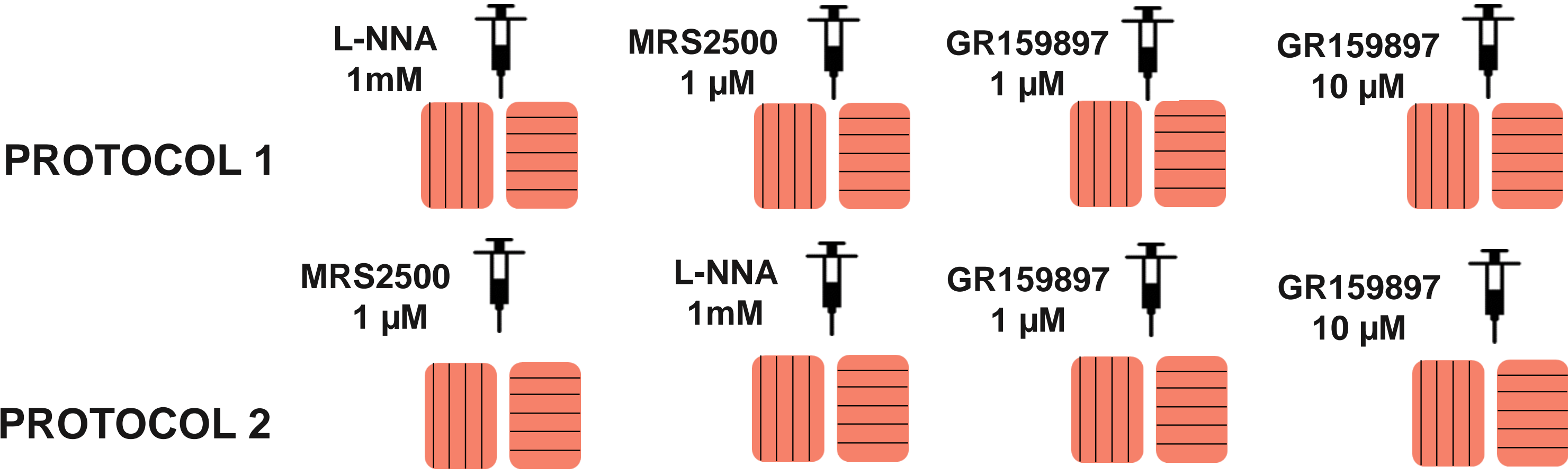
OBJECTIVES

1. Determine if the purinergic and nitrergic components are involved in the inhibitory neurotransmission of the longitudinal muscle in different colonic regions.
2. Check if the presence of inhibitory neural tone exists in the longitudinal muscle.
3. Identify the receptor responsible for the noncholinergic contraction in the longitudinal muscle.

*Circular muscle strips are taken in order to be compared with the longitudinal muscle.

MATERIAL AND METHODS

The study was carried out with 15 CD1 mice. Longitudinal and circular oriented muscle strips from colon were studied using the organ bath technique (NANC conditions). Two protocols were performed:



RESULTS

Table 1. Data of spontaneous contractions of circular and longitudinal muscle from proximal, mid and distal mouse colon

	PROXIMAL		MID		DISTAL	
	Longitudinal	Circular	Longitudinal	Circular	Longitudinal	Circular
Frequency (contractions/minute)	3,2±0,1	1,7±0,2 (***)	2,8±0,2	1,4±0,2 (***)	3,0±0,1	3,6±0,1 (n.s.)
Amplitude (mg)	185 ± 24	220±37	160±96	268±65	130±29	99±23
n	15	9	12	10	18	12

Data are expressed as mean±sem.*** Statistically differences between circular and longitudinal muscle layers. +++ Statistically differences between proximal, mid and distal colon circular muscle.

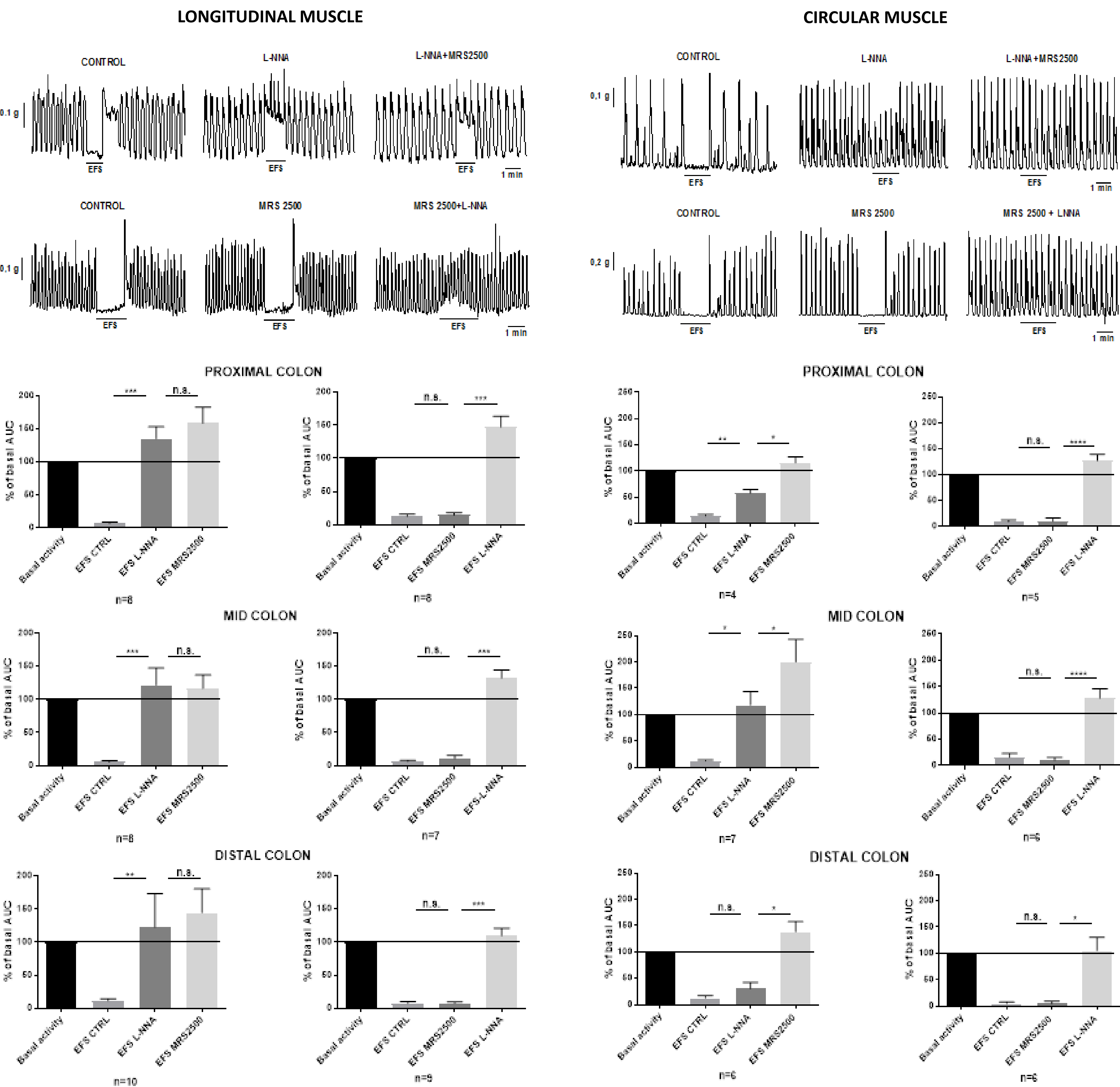


Figure 1. Purinergic and nitrergic inhibitory neurotransmission in proximal, mid and distal mouse colon. Inhibitory neurotransmission in longitudinal muscle was mainly nitrergic and in circular muscle was purinergic and nitrergic.

INHIBITORY NEURAL TONE

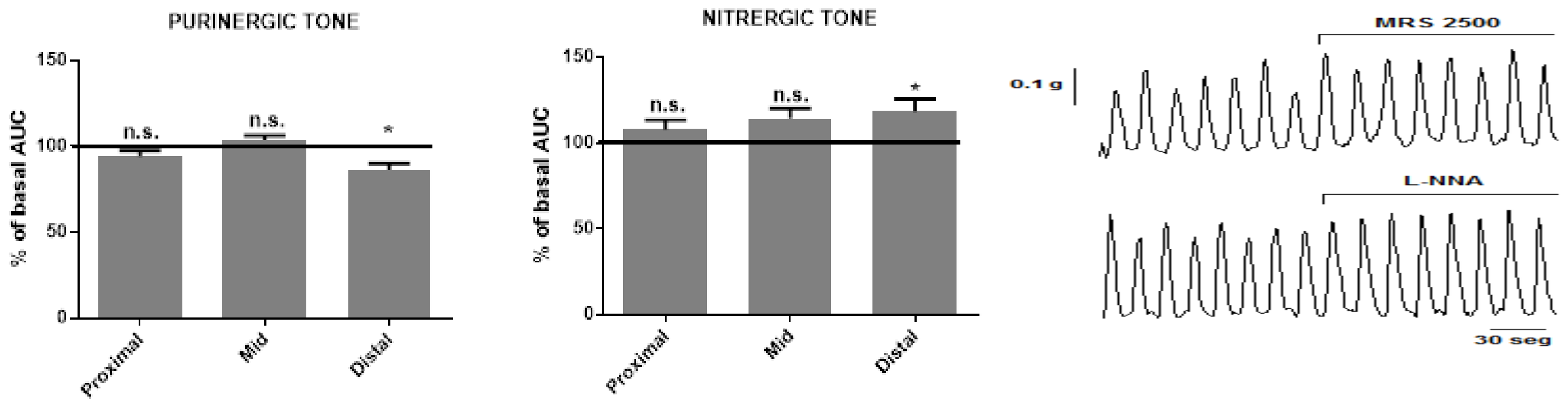


Figure 2. Inhibitory neural tone in different colonic regions from mouse longitudinal muscle. No inhibitory neural tone was observed.

INHIBITORY NEURAL TONE

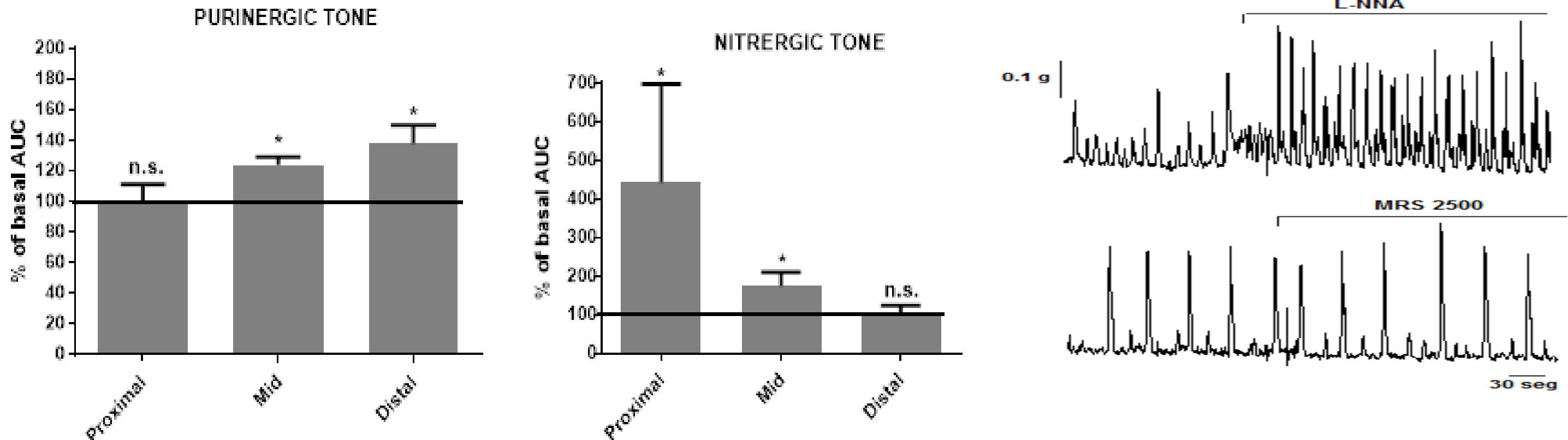


Figure 3. Inhibitory neural tone in different colonic regions from mouse circular muscle. An inverse gradient of purinergic and nitrergic inhibitory tone was observed in the mouse colon circular muscle.

EXCITATORY RESPONSE

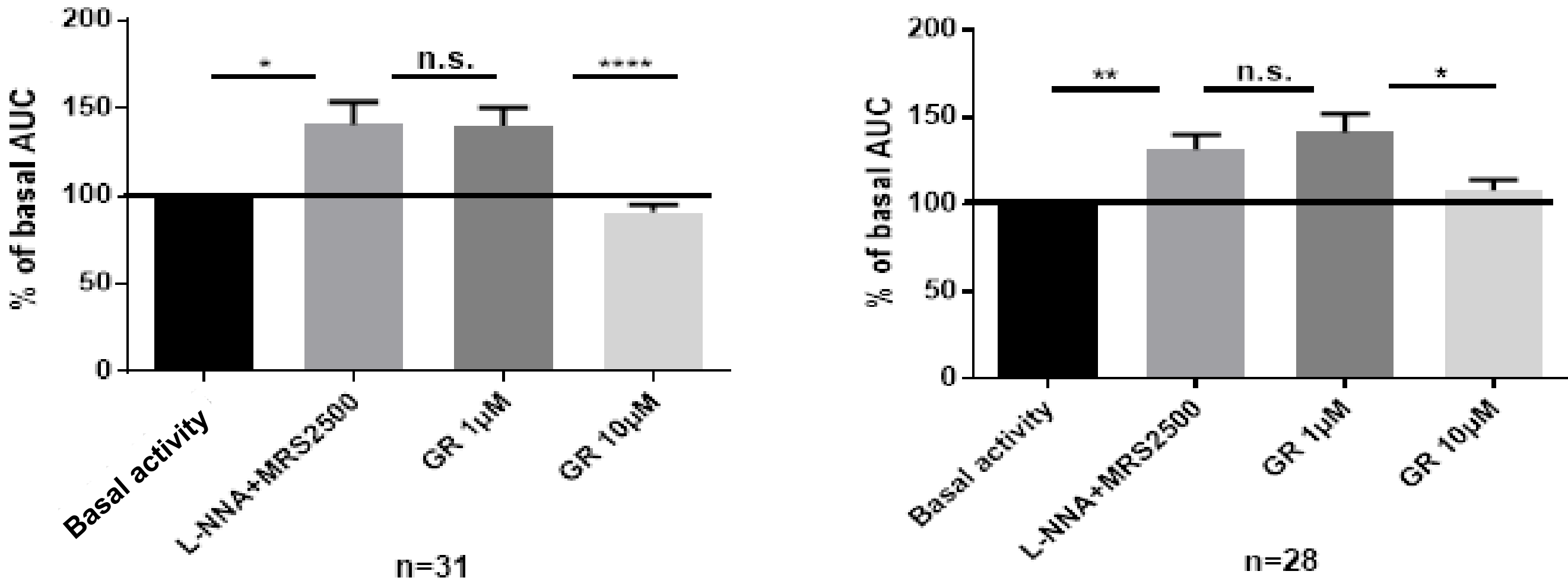


Figure 4. Effect of GR159897 on excitatory component contractions in the mouse longitudinal and circular muscle layers. GR159897 (selective antagonist of NK₂) blocked in a concentration-dependent the excitatory contractions.

DISCUSSION

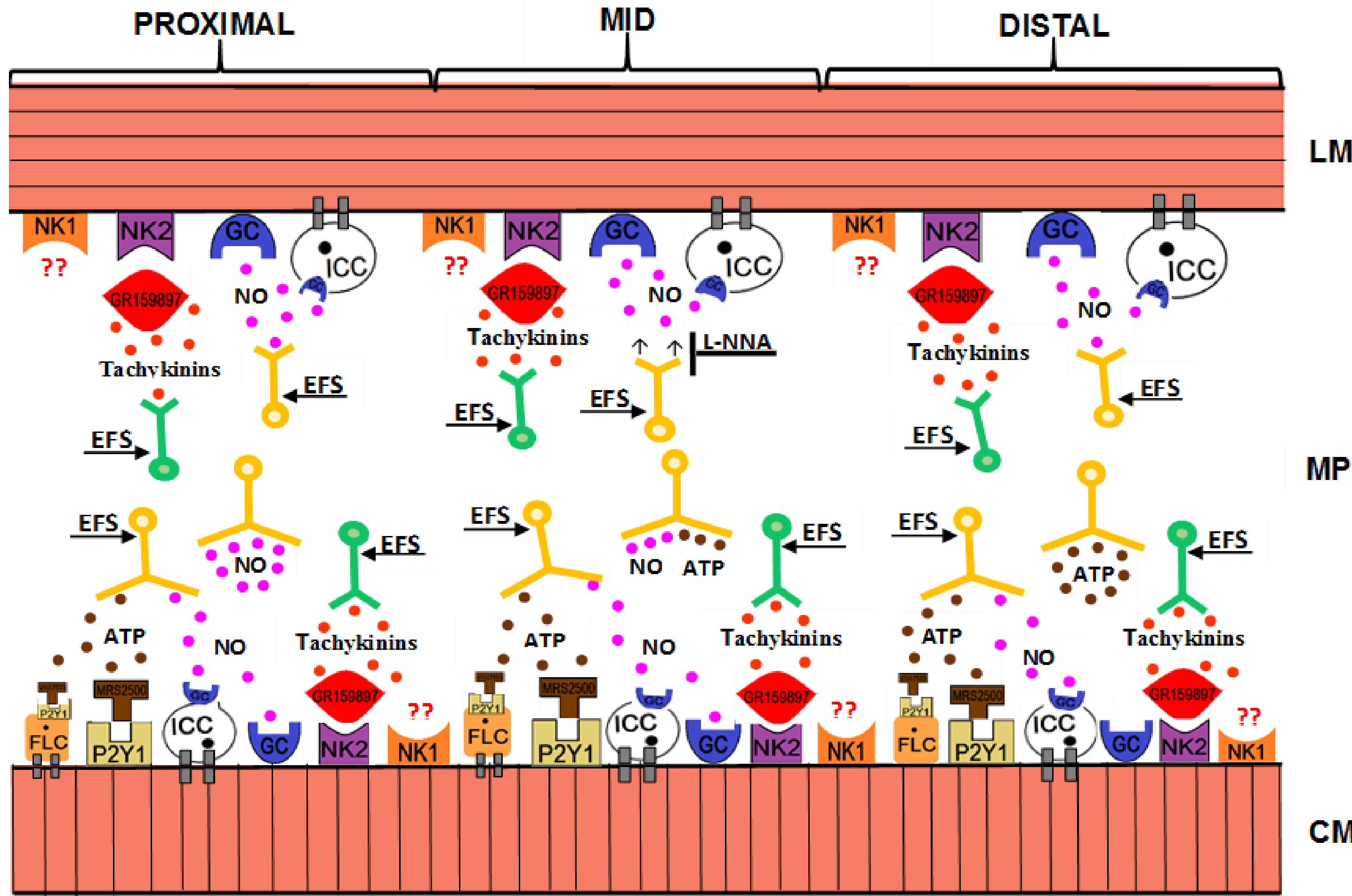


Figure 5. Inhibitory neurotransmission, inhibitory neural tone, noncholinergic excitatory neurotransmission and concepts reviewed in the study.

CONCLUSIONS

1. The inhibitory neurotransmission in the longitudinal muscle is nitrergic, whereas in the circular muscle there is a nitrergic/purinergic cotransmission.
2. There is no presence of the inhibitory tone in the longitudinal muscle. In contrast, the purinergic and nitrergic tone exists in the circular muscle.
3. The noncholinergic excitatory component is due to the tachykinins that act in the NK₂ receptors of the longitudinal and circular muscle layers.

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